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(54) **Core for hygienic absorbent products**

Kern für absorbierende hygienische Produkte

Noyau pour produits absorbants à usage hygiénique

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(56) References cited:
EP-A- 0 157 649
EP-A- 0 159 671
EP-A- 0 175 481
EP-A- 0 210 968
EP-A- 0 254 476
EP-A- 0 325 416
EP-A- 0 399 511
GB-A- 2 087 240
GB-A- 2 124 907

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Description

The present invention relates to a fluid-absorbing core component, a fluid-absorbing article utilizing such component, and a method for making a fluid-absorbing core component.

It is generally recognized that success in the marketplace with fluid-absorbing articles such as disposable diapers, incontinence garments or pads, catarnenial devices and the like, depends substantially on functional efficiency of the article, as well as comfort to the wearer, appearance and price of the article.

In general, such articles have an efficient fluid-retaining core component, usually comprising one or more layers of absorbent material such as wood pulp, rayon, gauze, tissue or the like, and, in some cases, superabsorbent particulate matter or powder (SAP). To protect clothing, and surrounding areas from being wetted and stained by fluids retained in a core component, such articles are generally backed by a fluid-impervious backing component. They also usually possess a nonwoven-type fabric or coverstock material, which defines, at least, the body-contacting surface of the fluid-absorbing article. The nonwoven coverstock material, along with optional intermediate acquisition layers, are relied on to control fluid flow and insulate the wearer from continuous contact with moisture already retained in the core. The facing or coverstock must be pervious to fluids on its body-contacting side to promote rapid transfer of each fluid insult directly into the fluid absorbent core component while, itself, remaining soft, dry and essentially nonabsorbent to aqueous fluids.

The art describes vinous constructions for core components. Radwanski et. al. in U.S. Pat. No. 4,767,586 describes disposable diapers containing nonwoven webs of cellulosic fiber produced using superimposed layers of material in selected areas. it describes that webs of cellulosic fiber (i.e., for paper making) may be used in different fiber compositional areas. Drummond in U.S. Pat. No. 2,751,962 describes producing fibrous products in which coarse and fine denier fiber are incorporated into an integral web.

Marshall et. al. in U.S. Pat. No. 4,931,357 describes forming fibrous material from webs formed of different staple mixtures fed through separate lickerins feedably arranged in parallel axial relation over a conveyor screen or belt. The fiber feed is oriented on the belt by use of baffles to define separate lateral and vertical fiber cross-sections within the resulting web. The web, as shown, is folded over to form a cylindrical-shaped component having a homogeneous external layer.

Anderson in U.S. Pat. No. 4,223,677 describes an absorbent fibrous core structure in which absorbent fibers of less than about 6.35 mm in length are graded by length through the thickness of the absorbent structure.

European Patent Application No. EP-A-0 254 476 discloses an absorbent article having an acquisition zone of lower average density than the storage zone. The lower density zone facilitates rapid uptake of liquid in that portion of the article which is most susceptible to initial wetting.

European Patent No. EP-A-0 325 416 describes another variant of the above absorbent article with differential densities in the acquisition zone and storage zone.

European Patent No. EP-A-0 399 511 is concerned with an airlaying apparatus which facilitates the deposition of two or more different fibrous materials in such a manner that the resulting product is not limited to being formed of discrete layers of the different materials.

In British, Patent Application No. GB-A-2 087 040 an absorbent batt is, disclosed, consisting of two reservoirs disposed one on top of the other. The first reservoir is located adjacent the open cover side of the article and the second reservoir is remote from the opening and contains a superabsorbent. The higher absorbency of the second reservoir relative to the first reservoir is attributable to the presence of the superabsorbent.

It is recognized that additional improvements to fluid-absorbing articles are needed to enhance the comfort of the wearer of such articles. Such improvements may include increasing the overall efficiency and liquid acquisition rate of the core component itself, and improving fluid flow control, especially back flow or rewet properties, by varying the make up of core component.

There is a need for a fluid-absorbent core component which has increased fluid receptivity and fluid storage efficiency, and reduced rewet characteristics. There is also a need for a core component which is capable of avoiding the creation of local areas of over-saturation upon insults to the core. It is an object of the invention to provide a core component for use in a fluid-absorbing article which has enhanced fluid retention and control.

The core component of the present invention has improved fluid control. The core component comprises a plurality of zones including a zone of vulnerability arranged within the core component for maximum potential exposure to initial wetting. There is at least one additional core zone positioned in the core component in direct or indirect fluid receivable relation from the zone of vulnerability in an area of reduced potential exposure to initial wetting.

The improved core component of the invention achieves a capillary gradient through the layers of the structure to effect fluid migration away from the fluid-receiving portion of the core component, i.e., the zone of vulnerability, and through the core component in radial, lateral or axial direction. The invention recognizes that a capillary gradient is achieved in several ways: (1) by varying from zone to zone through the core component the denier of the synthetic fiber or filament in the wadding component; (2) by varying the concentration of the fibers in the fiber mix in each zone of the core component wherein the fiber mix contains one fiber which has a higher average surface area and a lower average volume than the other fiber in the mix; or (3) by varying both the denier of the synthetic fiber and the

concentration of the fibers in the fiber mix. In these ways the average volume to surface area ratio and the average pore size changes from zone to zone. If the concentration of the fibers in the fiber mix changes, in addition to changed pore size, the average liquid-solid contact angle from zone to zone also changes.

To achieve the desired capillary gradient, the zone of vulnerability and additional core zones encompass a variety of fiber mixes and core component structures. The zone of vulnerability is usefully characterized by having a greater average pore size than the average pore size of the more wettable additional core zones arranged in direct or indirect fluid-receivable relation from the zone of vulnerability, and may additionally have a greater average liquid-solid contact angle than the average liquid-solid contact angle of the more wettable additional core zones arranged in direct or indirect fluid-receivable relation from such zone of vulnerability. The zone of vulnerability is further usefully characterized by utilizing synthetic fiber or filament having an average fractional value of fiber volume-to-fiber surface area, "volume to surface area" (e.g., ml/cm^2) higher than the corresponding average volume to surface area value within the wadding components of the additional core zones arranged in direct or indirect fluid-receivable relation to the zone of vulnerability.

In the additional core zones the average volume to surface area fractional value, the average pore size, and generally the average"liquid-solid contact angle, within wadding components of individual additional core zones decrease in value relative to increased distance from the zone of vulnerability and relative to decreased potential exposure to initial wetting. For example, the described values preferably decrease in value in general proportion to increased geometric distance from the zone of vulnerability, and in general proportion to decreased potential exposure to initial wetting. For purposes of the present invention, the average value of the volume to surface area for fiber or fibrillated film in the zone of vulnerability within the above-indicated parameters can vary from about 1 ml/20,000 cm^2 to about 1 ml/500 cm^2 or higher, and the corresponding average volume to surface area value within corresponding additional core zones can usefully vary from about 1 cc/25,000 cm^2 to about 1 cc/40,000 cm^2 or lower.

In discussing suitable structures of the core component of the invention, a core component laying on a flat surface, with a backing sheet underneath the core component and a coverstock on top will be utilized for illustration. Then, the core component can be described with reference to its x, y and z axes described below. The y-axis is arbitrarily chosen as the axis across the core component in the direction which would correspond to the direction from one leg cuff to a second leg cuff. The x-axis is described as the axis perpendicular to the y-axis. The core component is described as having a "top" which defines a portion of the core component which receives the initial wetting, and is in the plane of the x and y axis, designated the x-y plane; and a "bottom" which defines the portion of the core component adjacent to a fluid-impervious backing. The distance from the top to the bottom of the core component defines the thickness of the core component and describes a z-axis from the top surface. "Radial" shall refer to the perimeter around the zone of vulnerability in the x-y plane. "Lateral" shall refer to the x and y directions from the zone of vulnerability in the x-y plane. "Axial" shall refer to the z-axis through the core component. Fluid migration in the core component of the invention from the zone of vulnerability to the additional core zones shall be described as being generally in the radial direction (i.e., in the x-y plane to the perimeter around the zone of vulnerability), lateral direction (i.e., in the direction of the x or y axis in the x-y plane), or axial direction (i.e., through the core component in the direction of the z-axis). The additional core zones which is the furthest in geometric distance from the zone of vulnerability is said to be the outermost additional core zone.

Figure 1 is a schematic top plan view of a fluid absorbing article showing the core component of the invention in hidden outline. Figures 2-4 are schematic cross-section views of alternative embodiments of the core component of the invention taken along line 2-2 of Figure 1. Figures 5A, 5B and 5C exemplify progressive steps representing a suitable technique for forming the core zones of the core component of the invention. Figures 6-7 are schematic top plan views of alternative embodiments of the invention.

One embodiment of the instant invention is shown in schematic top plan view in Figure 1 in use in a fluid absorbing personal article in the general form of an open diaper 1, showing core component 4 in hidden outline, coversheet 2, leg seal cuffs 3, and adhesive tabs (not numbered). The fluid-impervious backing component is not shown in the figure. Coversheet 2 is preferably one formed from a plurality of bonded polyolefin resin fiber or fibrillated film containing webs (not shown) such as treated polypropylene (PP) or polyethylene (PE) staple including copolymers and having homogeneous or mixed denier per filament (dpf) values of a mono- or bicomponent-type fiber. Heat-sealed or cemented thereto is a highly hydrophobic water-impermeable leg seal cuff 3, preferably a topically treated polyolefin nonwoven material, and a core component 4 visible through non-woven coversheet 2, preferably in a rectangular or oval form. The core component of the invention is normally utilized in the form of a rectangular, circular, or oval-shaped body of loosely bonded (or unbonded) wadding, comprising fiber bundles, slivers, fibillated film and the like, of limited structural strength.

The zone of vulnerability has, as a primary absorbent material, a wadding component comprising synthetic fiber or filament such as polyester or polyolefin-containing fiber inclusive of polypropylene or polyethylene, or copolymers thereof, in an effective amount, here defined as 25%-100% and preferably 50%-100% based on the total weight of the zone. The zone of vulnerability

can also include, as desired, up to 75%, preferably 0% to 50%, of an additional fiber component having a higher fiber surface area and a lower volume, such as cellulose-based fiber. It preferably also contains superabsorbent matter. A useful combination for the zone of vulnerability, for example, includes a polyolefin/cellulose-based staple fiber mixture having a ratio, by weight, of 100%- 25%/0%- 75%, preferably 100%-50%/0%- 50%, and up to 10% of superabsorbent powder or particulate matter (SAP).

The additional core zones have wadding components which comprise fiber mixtures of synthetic fiber or filament and an additional fiber type, or the additional fiber type alone. The additional fiber preferably has a higher fiber surface area and a lower volume than that of the synthetic fiber, for example, such as cellulose-based fiber. Suitable additional core zones contain from 25% to 100%, preferably 50% to 100% of an additional fiber type, and up to 75%, preferably 50% to 100% of an additional fiber type, and up to 75%, preferably up to 50% synthetic fiber.

One example of such a core component follows: the zone of vulnerability comprises 50% synthetic fiber or filament, and 50% cellulose-based fiber; a first adjacent additional core zone comprises 20% synthetic fiber and 80% cellulose-based fiber; and an outermost additional core zone comprises 100% cellulose-based fiber. Superabsorbent particulate matter (SAP) is preferably added to each zone. For example, if 10% SAP is added to the zone of vulnerability the fiber percentage by weights would change to 45% synthetic fiber and 45% cellulose based fiber, the balance percentage by weight in SAP. Similarly, the first additional core zone contains 10% synthetic fiber, 70% cellulose-based fiber and 20% SAP; the outermost core zone contains 0% synthetic fiber, 50% cellulose-based fiber and 50% SAP.

Herein the term "denier" shall have its art recognized definition, i.e., it shall mean a measure of filament or thread thickness expressed as grams per 9000 meter length. A suitable fluid absorbent wadding component within the zone of vulnerability, for present purposes, comprises homogeneous or mixed monocomponent or bicomponent synthetic fiber or filament, usefully one having an average dpf value within a range of 3 to 50 dpf, preferably 10.0-40.0. Synthetic fiber or filament in the wadding components within the fluid receivable additional core zones comprise fiber or filaments having average dpf values within a range of 1-40 dpf, preferably 2.0-40. Such fiber or filarment may be crimped or uncrimped, as desired.

For purposes of the present invention, the term "synthetic fiber" infers to staple fiber, filament, or fibrillated film selected from the group consisting of polyolefin, polyester and nylons. Suitably the fibers or films forming the zones of the core component are modified for conventional processing steps (i.e., cutting, crimping and carding) and for control of flow-through properties, by topical treatment with modifiers or by the inclusion of suitable modifiers within the spun melt itself to increase hydrophilic or antistatic properties. Such suitable fiber processing is disclosed, for instance, in U.S. Pat. No. 5,033,172 of James H. Harrington in which one or more N,N-polyalkoxylated 10-22 carbon fatty amines with up to 60% of 10-22 carbon fatty acid amides are incorporated in the spun melt, and/or treated in accordance with U.S. Pat. No. 5,045,387 of A. C. Schmalz, in which an effective amount of a modifier composition comprising at least one of (a) a component containing alkoxylated ricinoleate with up to about 15%, by weight of modifier composition, of an 18 carbon fatty acid; (b) a corresponding hydrogenated derivative of (a); and (c) a polyalkoxylated polydimethylsiloxane, having up to about 80% by weight of modifier composition, of one or more of component (a), (b), or combination thereof is topically applied onto hydrophobic polyolefin fiber or corresponding fibrillated film.

Also useful, for purposes of the present invention, is the above-indicated incorporation of strategically positioned art-recognized superabsorbent powder or particulate matter within the core zones to improve liquid transport and favor more even and rapid distribution of fluids. Such components are natural absorbents such as guar gum, xanthan gum, or chitin, or are synthesized by the polymerization of acrylic acid, acrylate esters, vinyl alcohol, ethylene oxide, acrylamide, and other vinyl monomers. One of numerous commercially available products of this type is Sumikagel® S-50 (a product of Sumitomo Company).

Referring again to the Figures, Figures 2-4 represent diagrammatic cross-sections of several suitable variations of core component 4 taken along line 2-2 of Figure 1, in which the respective zones of vulnerability are respectively shown as (a), (a'), and (a"), and the respective additional core zones as (b) and (c), (b') and (c'), and (b") and (c"). If desired, the number of additional core zones can be conveniently increased to six or more, for example ten, and is preferably in the range of one to six additional core zones. In high volume or commercial production a core component having one to three additional core zones may be preferable, with those having one additional core zone generally being the simplest to manufacture. The zones are shown in cross-section in suitable, semi-concentric configuration (Fig. 2), in stacked horizontal configuration (Fig. 3), and in vertical/contiguous configuration (Fig. 4). The core zones may be shaped generally as rectangular hexahedrons and positioned in adjacent parallel placement to one another. In each case from the zone of vulnerability, designated by unprimed or primed "a", through additional core zones designated by unprimed or primed "b" and "c," the zones are characterized as having progressively decreased average volume to surface area ratio values, pore size and potentially decreased average liquid-solid contact angles relative. As previously described, these characteristics are obtained, for instance, by varying the fiber mix so as to lower the average dpf of the synthetic fiber, and by varying the average liquid-solid contact angle by increasing the

concentration of one or more supplemental fibers, preferably fibers having a lower average volume and a higher average fiber surface area, such as a cellulose-based fiber.

In Figure 2, (a) represents a centrally located zone of vulnerability, preferably one containing 25%-100%, preferably 50%-100% of a synthetic thermoplastic fiber preferably topically or otherwise treated for working and retained hydrophilic properties. Such fiber, as above noted, can be a spun and treated polyolefin resin, resin mix or copolymers thereof (i.e., PP/PE) having relatively high average dpf values within the above-indicated range, and combined with 0%-75%, preferably 0%-50%, by weight of cellulose-based fiber, and SAP powder or particulate matter as above described.

Additional core zones, (b) and (c) of Figure 2, in that order, represent individual homogeneous zones comprising fibrous absorbent material having a progressively smaller average fiber volume and higher average fiber surface area and a progressively smaller average pore size, and, if the concentration of fibers in the fiber mix also change, a lower average liquid-solid contact angle as the relative geometric distance from zone (a) increases. Zones (a) (b) and (c) can be individually bonded (or unbonded), or bonded "in toto" using conventional bonding techniques. The embodiment illustrated in Figure 2 demonstrates a structure in which fluid migration from the zone of vulnerability occurs in both the lateral and axial directions. The embodiment illustrated in Figure 3 demonstrates fluid migration in the axial direction. The embodiment illustrated in Figure 4 demonstrates fluid migration in the lateral direction.

The embodiments illustrated in Figures 6 and 7 demonstrate fluid migration in the radial direction. A particularly suitable embodiment for the core component of the invention is shown in schematic top plan view in Figure 6 in which a zone of vulnerability (a‴) is radially surrounded by a single additional core zone (b‴). The top and bottom of zone of vulnerability (a‴) art not surrounded by the additional core zone (b‴), and a bottom view of this configuration (not shown) would show essentially the same configuration as that shown in Figure 6.

Figure 7 illustrates an alternative embodiment in schematic top plan view of the radial configuration in which another additional core zone (c‴) is added to the structure in which additional core zone (c‴) is formed radially around additional core zone (b‴). The radial configurations illustrated in Figures 6 and 7 also accommodate any number of additional core zones, preferably from one to six additional core zones, preferably one or two additional core zones, and most preferably one additional core zone.

Encouraging fluid migration in several directions is achieved by combining the structures described. An alternative embodiment of the radial configuration in Figure 6, for example, comprises stacking a first radial structure upon a second radial structure (not shown) in which the zone of vulnerability of the second radial structure has a reduced percentage by weight of synthetic fiber than the percentage by weight of synthetic fiber in the zone of vulnerability of the first radial structure to create a gradient in both the radial and axial direction.

Figure 5A represents, in schematic cross-section view, a step or stage in a process suitable for producing zoned core components within the scope of the present invention, in which a continuous flexible screen or belt 5 is supported from movable support elements 9 having end-wise attached flanges 10 slideably resting on corresponding support flanges 11 at the top of a "U" shaped perforated forming trough 6 forming an upper surface of suction box 7. As shown, one core layer, corresponding, for instance, to additional core zone (c) of Figure 2 has been formed from an air entrained fiber mix 12 supplied from above (see arrows) through twin lickerins axially arranged in machine direction and a mixing zone (not shown). The entrained fiber is shown to be adhered to the corresponding "U" shaped flexible screen or belt 5 with the aid of a partial vacuum obtained through vacuum exhaust pipe 8 on the reverse side of the belt and trough 6.

An additional core zone, here represented in Figure 5B as layer (b), is conveniently applied at a downstream station, using different fiber, or fiber/particulate mixtures to obtain a core zone of higher fiber volume and lower fiber surface area (i.e., a numerically higher volume to surface area value) and a larger average pore size, and potentially a larger average liquid-solid contact angle than laid down in zone (c).

Figure 5C schematically represents a cross-section at a further downstream station in which the zone of vulnerability or (a) core zone is formed. As shown, the air-entrained fiber or particulate matter making up such zone is applied from above in the general manner of the previous upstream stations as shown in Figures 5A and 5B, however, the (a) zone can also be separately laid down "in toto" as a compiled fiber or filament mass as webs, or even as fibrillated film, and the entire wadding optionally bonded together using sonic, thermal, laser or similar conventional bonding techniques (not shown).

The dimensions of each core zone vary according to the fluid-absorbing article and the size of the particular article in which the core component is utilized. For example, the size of each zone depends upon the structure of the core component and the number of additional core zones utilized. A suitable zone of vulnerability has a diameter within the range of about 5 cm to about 10 cm. The zone of vulnerability ranges in thickness from about 2 mm to about 2 cm. The additional core zones range in thickness from about 2 mm to about 2 cm. Additional core zones surrounding the zone of vulnerability in the radial or lateral direction represent increments from the zone of vulnerability in the x-y plane. The increments of the additional core zones range in size from about 0.5 cm to about 20 cm.

EXAMPLE I

A. Three test diaper cores, identified as T-1, T-2 and T-3 and having the general semi-concentric configuration as described in Figure 2, are formed from sequentially-applied mixtures of air entrained 18 dpf (0.75 inch staple) polypropylene and cellulose fluff pulp fiber (obtained from Georgianier Wood Pulp softwood bleached Kraft from ITT Rainier Co.): The mixtures are applied at five separate stations onto a movable screen or belt in the manner generally described with respect to Figures 5A-5C. The resulting unbonded zones are sequentially laid down in about 1"-thick layers having the following concentrations (in weight percent) of polypropylene/cellulose: 0/100, 10/90, 15/85, 25/75 and 50/50 (zone of vulnerability).

The test cores, in toto, contain 23 weight percentage (23 wt. %) polypropylene staple with a density of about 0.045 gm/cc. The test cores are then topped with identical polypropylene nonwoven coverstock and tested for Liquid Acquisition and Rewet characteristics (Table I) using a pressure-driven GATS (Gravimetric Absorbency Testing System) with GATS II test equipment from M/K Systems Inc. of Danvers, Massachusetts. A raised (15 cm) liquid reservoir is feedably connected by tubing (for upward flow) beneath a single-holed simple platform. The test core and a weighted coverstock are placed thereon above the hole under 0.1 psia. A flow valve is opened for one (1) second and reservoir weight loss recorded. The reservoir loss (gm) divided by time, provides initial acquisition rate data.

The rewet test is effected by obtaining an 80% core saturation using as synthetic urine, a 53 dyne/cm dilute saline-surfactant solution obtained from Pluronic® 10-R-8 surfactant from BASF Inc. After five (5) minutes the test core is removed and covered with a second preweight dry bonded core and pressed (0.5 psi) for two (2) minutes, the increase in weight of the dry-bonded core is reported as rewet in grams.

As a control, Example IA is repeated but using identical polypropylene/cellulose staple mixtures at each zone application station to obtain uniformly-distributed fiber mix throughout the core at a density of about 0.045 gm/cc and a total content of polypropylene staple of about 23 wt. %. The control cores, identified as C-1, C-2 and C-3, are tested for Acquisition Rate and Rewet Properties as before and the results reported as an average in Table I below.

As a further control, three cores, identified as C4, C-5 and C-6 are prepared using 100 weight percent of the same batch cellulose as that used in the previous example in each zone to obtain a core of about the same density and weight. These control cores are identically tested for Acquisition Rate and Rewet Properties and the results reported as an average in Table I below. As a comparison for Acquisition Rate, it is noted that maximum unimpeded flow is 10.7 ml/second.

Table I

Core Sample #	Acquisition Rate ml/second (av.)	Rewet (gm) (av.)
T-1, T-2, T-3,	9.7	7.9
C-1, C-2, C-3	8.8	8.0
C-4, C-5, C-6	8.1	9.9

B. Example IA is repeated in core samples T4, T-5 and T-6, using 15 dpf 0.75" polyester staple in place of polypropylene staple. The cores are identically tested as before and the averaged test results reported in Table II below.

Example IA is repeated with control cores C-7, C-8 and C-9, in which the same total amounts of polyester (PET) and identical weight percentage of PET/cellulose as used in T4, T-5 and T-6 are applied at each zone to obtain a uniform staple distribution through the cores. The cores are tested as before and the averaged test results reported in Table II below as averages. Again, it is noted that maximum unimpeded flow rate is 10.7-ml.sec.

Table II

Core Sample #	Acquisition Rate ml/second (av.)
T-4, T-5, T-6	10.5
C-7, C-8, C-9	8.7

Examples IA and IB are repeated but with the addibon of 5 weight percent of Sumikagel® S-50 (SAP) within the zone of vulnerability and 5 weight percent within the outermost zone (the first laid down in Figure 5A). Rewet determinations are carried out as before and the averaged test results reported in Table III as average values in comparison with Example IA and IB values.

Table III

Core Sample #	Rewet (no SAP)(gm)	Rewet (with SAP)(gm)
T-1, T-2, T-3	7.9	5.5
C-1, C-2, C-3	8.0	6.3

EXAMPLE II

Test diaper cores, identified as T-7, T-8, and T-9 and having the general radial configuration as described in Figure 6, are formed from mixtures of air entrained 20 dpf (0.75 inch staple) polypropylene and cellulose fluff pulp (obtained from Georgianier Wood Pulp bleached Kraft from ITT Rainier Co.). The following concentrations (in weight percent) of polypropylene/cellulose: 0/100 and 50/50 (zone of vulnerability) are utilized. A first additional core zone comprising an approximately one (1) inch layer of 100% cellulose is formed, and a hole of approximately 1-1/2 to 2" in diameter is punched and removed from a central area of the additional core zone. A second layer of the 50/50 concentration is formed, and a generally circular form of approximately 1-1/2 to 2 inches in diameter, representing the zone of vulnerability, is removed from the second layer. The circular form is inlaid into the hole punched in the first layer to form a core component with a zone of vulnerability and one additional core zone.

The test cores, in toto, contain 33 weight percentage (33 wt. %) polypropylene staple with a density of about 0.05 gm/cc. The test cores are then topped with identical polypropylene nonwoven coverstock and tested for Liquid Acquisition (Table I) using a pressure-drive GATS (Gravimetric Absorbency Testing System) with GATS II test equipment from M/K Systems Inc. of Danvers, Massachusetts, as described in Example I.

As a control, the example above is repeated but using identical polypropylene/cellulose staple mixtures at each zone application station to obtain uniformly-distributed fiber mix throughout the core at a density of about 0.05 gm/cc and a total content of polypropylene staple of about 33 wt. %. The control cores, identified as C-10, C-11 and C-12 are tested for Acquisition Rate as before and the results reported as an average in Table IV below.

As a further control, three cores, identified as C-13, C-14 and C-15 are prepared using 100 weight percent of the same batch cellulose in each zone to obtain a core of about the same density and weight. These control cores are identically tested for Acquisition Rate and the results reported as an average in Table IV below. As a comparison for Acquisition Rate, it is noted that maximum unimpeded flow is 10.7 ml/second.

Table IV

Core Sample #	Acquisition Rate
T-7, T-8, T-9	9.16 ml/sec (av.)
C-10, C-11, C-12	7.81 ml/sec (av.)
C-13, C-14, C-15	7.35 ml/sec (av.)

Claims

1. A core component for use in a fluid-absorbing article having a plurality of zones, said core component comprising:

(a) a zone of vulnerability positioned in said core component for maximum potential exposure to initial wetting, said zone of vulnerability having a wadding component comprising synthetic fiber or filament; and
(b) at least one additional core zone in the core component having a wadding component and arranged in the core component in an area of reduced potential exposure to initial wetting and in direct or indirect fluid-receivable relation from said zone of vulnerability;

wherein the wadding component in the zone of vulnerability is characterized by (c) a greater average port size than the average pore size of the wadding components in the at least one additional core zone and (d) a higher average fractional value of fiber volume-to-fiber surface area than the average fractional value of fiber volume-to-fiber surface area within the wadding component of the at least one additional core zone.

2. A core component as claimed in claim 1 wherein the wadding component in the zone of vulnerability is characterized by a greater average liquid-solid contact angle than that of the wadding component of the at least one additional core zone.

3. A core component as claimed in claim 1 wherein there is a plurality of additional core zones in the core component arranged in areas of reduced potential exposure to initial wetting and wherein the average fractional value of fiber volume-to-fiber surface area and the average pore size within the wadding components of said additional core zones decrease in value from zone to zone relative to increased geometric distance from said zone of vulnerability and corresponding decreased potential exposure to initial wetting.

4. A core component as claimed in claim 3 wherein the wadding component in the zone of vulnerability is characterized by a greater average liquid-solid contact angle than the average liquid-solid contact angle of the wadding components within the additional core zones and the average liquid-solid contact angle within the additional core zones decreases in value from zone to zone relative to increased distance from said zone of vulnerability and corresponding decreased potential exposure to initial wetting.

5. A core component as claimed in claim 1 wherein the core component contains one additional core zone to the zone of vulnerability.

6. A core component as claimed in claim 5 wherein the wadding component in the zone of vulnerability is further characterized by a greater average liquid-solid contact angle than the average liquid-solid contact angle of the wadding component within the additional core zone.

7. A core component as claimed in any of the preceding claims 1 - 6 further characterized in that the additional core zone is positioned about the zone of vulnerability in semi-concentric configuration.

8. A core component as claimed in any of claims 1 - 6 further characterized in that the zone of vulnerability and the additional core zone form generally rectangular hexahedrons in adjacent parallel placement to one another.

9. A core component as claimed in any of claims 1 - 6 further characterized in that the additional core zone is positioned in radial configuration around the zone of vulnerability.

10. A core component as claimed in any of the preceding claims further characterized in that the wadding component of the zone of vulnerability comprises about 25%-100% by weight of polyolefin or polyester staple fiber or filament.

11. A core component as claimed in claim 10 wherein the wadding component of the zone of vulnerability comprises about 50% to 100% by weight of polyolefin or polyester staple fiber or filament.

12. A core component as claimed in any of claims 1-10 further characterized in that the zone of vulnerability comprises about 25% to 100% of polyolefin or polyester staple fiber or filament and about 75% to 0% by weight cellulose-based fibers.

13. A core component as claimed in any of the preceding claims further characterized in that the zone of vulnerability comprises from about 0% up to about 50% by weight of a cellulose-based fiber.

14. A core component as claimed in any of claims 1-10 further characterized in that the zone of vulnerability comprises about 25% to about 75% of polyolefin or polyester staple fiber or filament and about 75% to about 25% by weight cellulose-based fibers.

15. A core component as claimed in any of the preceding claims wherein the additional core zone comprises cellulose-based fibers.

16. A core component as claimed in any of the preceding claims wherein the additional core zone contains from about 25% to 100% by weight of a cellulose-based fiber.

17. A core component as claimed in claim 15 wherein the additional core zone contains from about 50% to 100% by weight of a cellulose-based fiber.

18. A core zone as claimed in claims 3 or 4 wherein the zone of vulnerability comprises about 25% to 100% of polypropylene or polyethylene fiber or filament and 0% to about 75% by weight of cellulose-based fiber and wherein each additional core zone comprises about 25% to 100% of cellulose fiber, and 0% to about 75% by weight of synthetic fiber or filament, and wherein each additional core zone has a greater amount of cellulose-based fiber than the additional core zones geometrically closer to the zone of vulnerability.

19. A core component as claimed in any of the preceding claims further characterized in that the wadding components within the zone of vulnerability comprise fiber or filament having an average dpf value within a range of about 3 to about 50 dpf and wadding components within the additional core zone comprise fiber or filament having average dpf values within a range of about 1 to about 40 dpf.

20. A core component as claimed in claim 19 wherein the wadding components in the zone of vulnerability comprise fiber or filament having an average dpf value within a range of about 10.0 to about 40.0 dpf and wadding components within the additional core zone comprise fiber or filament having average dpf values within a range of about 2.0 to about 40.

21. A core component as claimed in any of the preceding claims further characterized in that the zone of vulnerability or the additional core zone contains superabsorbent.

22. A core component as claimed in claim 21 wherein the additional core component has up to 10% by weight superabsorbent.

23. A core component as claimed in any of the preceding claims wherein the additional core zones contain from about 20% to about 50% by weight of superabsorbent.

24. A core component as claimed in any of the preceding claims further characterized in that the additional core zone is bonded to at least one adjacent additional core zone or the zone of vulnerability.

25. A core component as claimed in any of claims 1-6 further characterized in that the at least one additional core zone is in lateral contact with said zone of vulnerability.

26. A core component as claimed in claims 1-6 further characterized in that at least one additional core zone is positioned so as to permit radial fluid migration from the zone of vulnerability to the at least one additional core zone.

27. A core component as claimed in any of the preceding claims further characterized in that the fiber or filament comprising the wadding components within the zone of vulnerability and additional core zones are of constant length.

28. A core component as claimed in any of claims 1-27 further characterized in that the average value of the fiber or fibrillated film volume to fiber or fibrillated film surface area in the zone of vulnerability is in the range of about 1 cc/20,000 cm^2 to about 1 cc/500 cm^2, and the average value of the fiber or fibrillated film volume to fiber or fibrillated film surface area in the additional core zone is in the range of about 1 cc/25,000 cm^2 to about 1 cc/40,000 cm^2.

29. A core component for us in a fluid-absorbing article as claimed in any of the preceding claims further characterized in that the zone of vulnerability comprises about 50% by weight synthetic fiber and about 50% by weight of cellulose-based fiber, and that a first additional core zone is arranged in radial configuration about the zone of vulnerability, and a second additional core zone comprising about 100% cellulose-based fiber is arranged adjacent to and in radial configuration around the first zone of vulnerability.

30. A method for the preparation of a core component for use in a fluid-absorbing article comprises laying down at least one additional core zone and a zone of vulnerability characterized in that the zones are comprised of fiber or filament possessing different average pore sizes and average fractional values of fiber or filament volume to fiber or filament surface area; the zone of vulnerability is positioned in the core component for maximum exposure to initial wetting and the at least one additional core zone is arranged in direct or indirect fluid-receivable relation to the zone of vulnerability and in areas of reduced exposure to initial wetting, and further characterized in that the at least one additional core zone has a smaller average pore size and average fractional value of fiber or filament volume to fiber or filament surface area than the respective average pore size and average fractional value of fiber or filament volume to fiber or filament surface area in the zone of vulnerability; and in that when two or more additional core zones are used the degree of difference in the average pore size and average fractional value of fiber or filament volume to fiber or filament surface area between the additional core zones increase in relation to increased distance from the zone of vulnerability and to reduced risk of initial wetting.

31. A method as claimed in claim 30 characterized in that the zone of vulnerability has an average liquid-solid contact angle greater than that of the at least one additional core zone and that when two or more additional core zones are used the degree of difference in average liquid-solid contact increases in relation to increased distance from the zone of vulnerability and to reduced risk of initial wetting.

32. A method for the preparation of a core component for use in a fluid-absorbing article as claimed in claims 30 or 31 further characterized by the step of laying the additional core zones about the zone of vulnerability in semi-concentric arrangement, or in lateral configuration about the zone of vulnerability, or in axial configuration beneath the zone of vulnerability, or in radial configuration around the zone of vulnerability.

33. A fluid-absorbing article comprising, in combination, the fluid-retaining core component of any of claims 1-29 arranged within at least a fluid permeable coverstock and a fluid impervious backing layer.

Patentansprüche

1. Kernkomponente zur Verwendung in einem fluidabsorbierenden Gegenstand mit einer Vielzahl von Zonen, wobei die Kernkomponente

(a) eine in der Kernzone zur maximal möglichen Exposition für eine Anfangsbefeuchtung der Zugänglichkeit bzw. Ungeschütztheit , wobei die zugängliche Zone der Zugänglichkeit eine synthetische Faser oder eine Filament enthaltende Polsterungskomponente enthält und
(b) zumindest eine zusätzliche Kernzone in der Kernkomponente mit einer Polsterungskomponente und angeordnet in der Kernkomponente in einem Bereich von verringerter möglicher

Exposition für eine Anfangsbfeuchtung und in direkter oder indirekter Fluid aufnehmbarer Beziehung bezüglich der Zone der Zugänglichkeit umfaßt,

worin die Polsterungskomponente in der Zone der Zugänglichkeit charakterisiert ist durch

(c) eine größere durchschnittliche Porengröße als die durchschnittliche Porengröße der Polsterungskomponenten in der zumindest einen zusätzlichen Kernzone und (d) einem höheren durchschnittlichen Teilwert des Faservolumens zum Faseroberflächenbereich als der durchschnittliche Teilwert des Faservolumens zum Faseroberflächenbereichs innerhalb der Polsterungskomponente der zumindest einen zusätzlichen Kernkomponente.

2. Kernkomponente nach Anspruch 1, worin die Polsterungskomponente in der Zone der Zugänglichkeit durch einen größeren durchschnittlichen Flüssigkeits-Feststoff-Kontaktwinkel als die Polsterungskomponente der zumindest einen zusätzlichen Kernzone gekennzeichnet ist.

3. Kernkomponente nach Anspruch 1, worin eine Vielzahl von zusätzlichen Kernzonen in der Kernkomponente in Bereichen der verringerten möglichen Exposition einer Anfangsbefeuchtung vorliegt und worin der durchschnittliche Teilwert des Faservolumens zum Faseroberflächenbereich und der durchschnittlichen Porengröße innerhalb der Polsterungskomponenten der zusätzlichen Kernzonen im Wert von Zone zu Zone relativ zum erhöhten geometrischen Abstand von dieser Zone der Zugänglichkeit und der entsprechend verringerten möglichen Exposition der Anfangsbefeuchtung abnimmt.

4. Kernkomponente nach Anspruch 3, worin die Polsterungskomponente in der Zone der Zugänglichkeit durch einen größeren durchschnittlichen Flüssigkeits-Feststoff-Kontaktwinkel als der durchschnittliche Flüssigkeits-Feststoff-Kontaktwinkel der Polsterungskomponenten innerhalb der zusätzlichen Kernzonen gekennzeichnet ist und der durchschnittliche Flüssigkeits-Feststoff-Kontaktwinkel in den zusätzlichen Kernzonen im Wert von Zone zu Zone relativ zum erhöhten Abstand von der Zone der Zugänglichkeit und entsprechend der abnehmenden möglichen Exposition der Anfangsbefeuchtung abnimmt.

5. Kernkomponente nach Anspruch 1, worin die Kernkomponente eine zusätzliche Kernzone zu der Zone der Zugänglichkeit enthält.

6. Kernkomponente nach Anspruch 5, worin die Polsterungskomponente in der Zone der Zugänglichkeit weiter durch einen größeren durchschnittlichen Flüssigkeits-Feststoff-Kontaktwinkel als den durchschnittlichen Flüssigkeits-Feststoff-Kontaktwinkel der Polsterungskomponente in der zusätzlichen Kernzone gekennzeichnet ist.

7. Kernkomponente nach einem der vorhergehenden Ansprüche 1 bis 6, weiter dadurch gekennezeichnet, daß die zusätzliche Kernzone um die Zone der Zugänglichkeit in halbkonzentrischer Konfiguration positioniert ist.

8. Kernkomponente noch einem der Ansprüche 1 bis 6, weiter dadurch gekennzeichnet, daß die Zone der der Zugänglichkeit und die zusätzliche Kernzone im allgemeinen rechtwinklige Hexaeder in benachbarter paralleler Anordnung zueinander bilden.

9. Kernkomponente nach einem der Ansprüche 1 bis 6, weiter dadurch gekennzeichnet, daß die zusätzliche Kernzone in radialer Konfiguration um die Zone der Zugänglichkeit positioniert ist.

10. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die Polsterungskomponente der Zone der Zugänglichkeit etwa 25 bis 100 Gew.-% Polyolefin- oder Polyesterstapelfaser oder -filament enthält.

11. Kernkomponente nach Anspruch 10, worin die Polsterungskomponente der Zone der Zugänglichkeit etwa 50 bis 100 Gew.-% der Polyolefin- oder Polyesterstapelfaser oder -filament enthält.

12. Kernkomponente nach einem der Ansprüche 1 bis 10, weiter dadurch gekennzeichnet, daß die Zone der Zugänglichkeit etwa 25 bis 100 Gew.-% einer Polyolefin- oder Polyesterstapelfaser oder -filament und etwa 75 bis 0 Gew.-% eine auf Zellulose basierende Fasern enthält.

13. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die Zone der Zugänglichkeit von etwa 0 bis etwa 50 Gew.-% auf Zellulose basierende Faser enthält.

14. Kernkomponente nach einem der Ansprüch 1 bis 10, weiter dadurch gekennzeichnet, daß die Zone der Zugänglichkeit etwa 25 bis etwa 75 Gew.-% Polyolefin- oder Polyesterstapelfaser oder -filament und etwa 75 bis etwa 25 Gew.-% eine auf Zellulose basierende Fasern enthält.

15. Kernkomponente nach einem der vorhergehenden Ansprüche, worin die zusätzliche Kernzone eine auf Zellulose basierende Fasern enthält.

16. Kernkomponente nach einem der vorhergehenden Ansprüche, worin die zusätzliche Kernzone von

etwa 25 bis 100 Gew.-% auf Zellulose basierende Faser enthält.

17. Kernkomponente nach Anspruch 15, worin die zusätzliche Kernzone von etwa 50 bis 100 Gew.-% eine auf Zellulose basierende Faser enthält.

18. Kernzone nach Anspruch 3 oder 4, worin die Zone der Zugänglichkeit etwa 25 bis 100 Gew.-% einer Polypropylen- oder Polyethylenfaser oder -filament und 0 bis etwa 75 Gew.-% auf Zellulose basierende Faser enthält und worin jede zusätzliche Kernzone etwa 25 bis 100 Gew.-% Zellulosefaser und 0 bis etwa 75 Gew.-% synthetische Faser oder Filament enthält und worin jede zusätzliche Kernzone eine größere Menge eine auf Zellulose basierende Faser, als die zusätzliche geometrisch näher zu der Zone der Zugänglichkeit liegenden Kernzonen aufweist.

19. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die Polsterungskomponenten in der Zone der Zugänglichkeit eine Faser oder Filament mit einem durchschnittlichen dpf-Wert in einem Bereich von etwa 3 bis etwa 50 dpf und die Polsterungskomponenten in der zusätzlichen Kernzone eine Faser oder Filament mit durchschnittlichen dpf-Werten in einem Bereich von etwa 1 bis etwa 40 dpf aufweisen.

20. Kernkomponente nach Anspruch 19, worin die Polsterungskomponenten in der Zone der Zugänglichkeit eine Faser oder Filament mit einem durchschnittlichen dpf-Wert in einem Bereich von etwa 10,0 bis etwa 40,0 dpf und die Polsterungskomponenten in der zusätzlichen Kernzone eine Faser oder Filament mit durchschnittlichen dpf-Werten in einem Bereich von etwa 2,0 bis etwa 40,0 aufweisen.

21. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die Zone der Zugänglichkeit oder die zusätzliche Kernzone ein Superabsorbens enthält.

22. Kernkomponente nach Anspruch 21, worin die zusätzliche Kernkomponente bis zu 10 Gew.-% des Superabsorbens enthält.

23. Kernkomponente nach einem der vorhergehenden Ansprüche, worin die zusätzlichen Kernzonen von etwa 20 bis etwa 50 Gew.-% des Superabsorbens enthalten.

24. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die zusätzliche Kernzone an zumindest eine benachbarte zusätzliche Kernzone oder der Zone der Zugänglichkeit gebunden ist.

25. Kernkomponente nach einem der Ansprüche 1 bis 6, weiter dadurch gekennzeichnet, daß die zumindest eine zusätzliche Kernzone in einem seitlichen Kontakt mit der Zone der Zugänglichkeit steht.

26. Kernkomponente nach den Ansprüchen 1 bis 6, weiter dadurch gekennzeichnet, daß zumindest eine zusätzliche Kernzone so positioniert ist, um eine radiale Fluidwanderung von der Zone der Zugänglichkeit zu der zumindest einen zusätzlichen Kernzone zuzulassen.

27. Kernkomponente nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die die Polsterungskomponenten enthaltende Faser oder Filament in der Zone der Zugänglichkeit und der zusätzlichen Kernzone von konstanter Länge sind.

28. Kernkomponente nach einem der Ansprüche 1 bis 27, weiter dadurch gekennzeichnet, daß der Durchschnittswert den Faser- oder fibrillierten Film-Volumens zu der Faser- oder fibrillierten Film-Oberflächenbereich in der Zone der Zugänglichkeit Bereich von etwa 1ml/20.000cm^2 bis etwa 1ml/500cm^2 und der Durchschnittswert des Faser- oder des fibrillierten Film-Volumens zum Oberflächenbereich der Faser oder des fibrillierten Films in der zusätzlichen Kernzone im Bereich von etwa 1ml/25.000cm^2 bis etwa 1ml/40.000cm^2 sind.

29. Kernkomponente zur Verwendung in einem fluidabsorbierenden Gegenstand nach einem der vorhergehenden Ansprüche, weiter dadurch gekennzeichnet, daß die Zone der Zugänglichkeit etwa 50 Gew.-% synthetische Faser und etwa 50 Gew.-% eine auf Zellulose basierende Faser enthält, und daß eine erste zusätzliche Kernzone in radialer Konfiguration um die Zone der Zugänglichkeit und eine zweite etwa 100 % eine auf Zellulose basierende Faser aufweisende zusätzliche Kernzone benachbart zu und in einer radialen Konfiguration um die erste Zone der Zugänglichkeit angeordnet sind.

30. Verfahren zum Herstellen einer Kernkomponente zur Verwendung in einem fluidabsorbierenden Gegenstand durch Ablegen zumindest einer zusätzlichen Kernzone und einer Zone der Zugänglichkeit, dadurch gekennzeichnet, daß die Zonen aus einer Faser oder Filament mit verschiedenen durchschnittlichen Porengrößen und durchschnittlichen Teilwerten des Faser- oder Filamentvolumens zum Faser- oder Filamentoberflächenbereichs bestehen, die Zone der Zugänglichkeit in der Kernkomponente zur maximalen Exposition einer

Anfangsbefeuchtung positioniert ist und die zumindest eine zusätzliche Kernzone in direkter oder indirekter fluidaufnehmbarer Beziehung zu der Zone der Zugänglichkeit und in Bereichen von verringerter Exposition von Anfangsbefeuchtung angeordnet ist und weiter dadurch gekennzeichnet, daß die zumindest eine zusäztliche Kernzone eine durchschnittliche Porengröße und einem durchschnittlichen Teilwert des Faser- oder Filament-Volumens zum Faser- oder Filament-Oberflächenbereich als die entsprechende durchschnittliche Porengröße und durchschnittlicher Teilwert des Faser- oder Filament-Volumens zum Faser- oder Filament-Oberflächenbereich in der Zone der Zugänglichkeit aufweist, und dadurch, wenn zwei oder mehr zusätzliche Kernzonen zum Grad des Unterschieds in der durchschnittlichen Porengröße und des durchschnittlichen Teilwerts des Faser- oder Filament-Volumens zum Faser- oder Filament-Oberflächenbereich zwischen den zusätzlichen Kernzonen verwendet werden, in Bezug auf den erhöhten Abstand von der Zone der Zugänglichkeit und dem reduzierten Risiko der Anfangsbefeuchtung erhöht ist.

31. Verfahren nach Anspruch 30, dadurch gekennzeichnet, daß die Zone der Zugänglichkeit einen durchschnittlichen größeren Flüssigkeits-Feststoff-Kontaktwinkel als die zumindest einen zusätzlichen Kernzone hat, und daß wenn zwei oder mehr zusätzliche Kernzonen verwendet werden, der Differenzgrad im durchschnittlichen Flüssigkeits-Feststoff-Kontakt in Bezug auf den erhöhten Abstand von der Zone der Zugänglichkeit und der reduzierten Risiko der Anfangsbefeuchtung zunimmt.

32. Verfahren zum Herstellen einer Kernkomponente zur Verwendung in einem fluidabsorbierenden Gegenstand nach Anspruch 30 oder 31, weiter gekennzeichnet durch den Schritt des Legens der zusätzlichen Kernzonen um die Zone der Zugänglichkeit in halbkonzentrischer Anordnung oder in lateraler Konfiguration um die Zone der Zugänglichkeit oder in axialer Konfiguration unter der Zone der Zugänglichkeit oder in radialer Konfiguration um die Zone der Zugänglichkeit.

33. Fluidabsorbierender Gegenstand enthaltend in Verbindung die fluidzurückhaltende Kernkomponente nach einem der Ansprüche 1 bis 29, die in zumindest einer fluidpermeablen Belegschicht und einer fluidundurchläßigen Rückenschicht angeordnet ist.

Revendications

1. Constituant de coeur pour utilisation dans un article absorbant un fluide ayant plusieurs zones, ledit constituant de coeur comprenant :

   (a) une zone de vulnérabilité placée dans ledit constituant de coeur pour une exposition potentielle maximale à une humidification initiale, ladite zone de vulnérabilité ayant un constituant de remplissage comprenant une fibre ou un filament synthétique ; et

   (b) au moins une zone de coeur supplémentaire dans le constituant de coeur ayant un constituant de remplissage et disposée dans le constituant de coeur dans une région d'exposition potentielle réduite à une humidification initiale et en relation directe ou indirecte de réception d'un fluide de plus ladite zone de vulnérabilité ;

   dans lequel le constituant de remplissage dans la zone de vulnérabilité est caractérisé par (c) une taille moyenne de pores plus grande que la taille moyenne des pores des constituants de remplissage dans ladite au moins une zone de coeur supplémentaire et (d) une valeur moyenne de fraction volume des fibres-sur-surface des fibres plus élevée que la valeur moyenne de fraction volume des fibres-sur-surface des fibres dans le constituant de remplissage de ladite au moins une zone de coeur supplémentaire.

2. Constituant de coeur selon la revendication 1, dans lequel le constituant de remplissage dans la zone de vulnérabilité est caractérisé par un angle de contact liquide-solide moyen plus grand que celui du constituant de remplissage de ladite au moins une zone de coeur supplémentaire.

3. Constituant de coeur selon la revendication 1, dans lequel il y a plusieurs zones de coeur supplémentaires dans le constituant de coeur arrangées dans les régions d'exposition potentielle réduite à une humidification initiale et dans lequel la valeur moyenne de fraction volume des fibres-sur-surface spécifique des fibres et la taille moyenne des pores dans les constituants de remplissage desdites zones de coeur supplémentaires ont des valeurs qui diminuent de zone à zone en fonction de l'augmentation de distance géométrique depuis ladite zone de vulnérabilité et de la réduction correspondante de l'exposition potentielle à une humidification initiale.

4. Constituant de coeur selon la revendication 3, dans lequel le constituant de remplissage dans la zone de vulnérabilité est caractérisé par un angle de contact liquide-solide moyen plus grand que l'angle de contact liquide-solide moyen des constituants de remplissage dans les zones de coeur supplémentaires, et l'angle de contact liquide-solide moyen dans les zones de coeur supplémentaires ont des valeurs qui diminuent de zone à zone en fonction de l'augmentation de distance depuis ladite zone de vulnérabilité et de la réduction correspondante

de l'exposition potentielle à une humidification initiale.

5. Constituant de coeur selon la revendication 1, dans lequel le constituant de coeur contient une zone de coeur supplémentaire à la zone de vulnérabilité.

6. Constituant de coeur selon la revendication 5, dans lequel le constituant de remplissage dans la zone de vulnérabilité est en outre caractérisé par un angle de contact liquide-solide moyen plus grand que l'angle de contact liquide-solide moyen du constituant de remplissage dans la zone de coeur supplémentaire.

7. Constituant de coeur selon l'une quelconque des revendications 1 à 6 précédentes, caractérisé en outre en ce que la zone de coeur supplémentaire est placée autour de la zone de vulnérabilité en configuration semi-concentrique.

8. Constituant de coeur selon l'une quelconque des revendications 1 à 6, caractérisé en outre en ce que la zone de vulnérabilité et la zone de coeur supplémentaire forment des hexaèdres généralement rectangulaires disposés parallèles et adjacents les uns aux autres.

9. Constituant de coeur selon l'une quelconque des revendications 1 à 6, caractérisé en outre en ce que la zone de coeur supplémentaire est placée en configuration radiale autour de la zone de vulnérabilité.

10. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre en ce que le constituant de remplissage de la zone de vulnérabilité comprend environ 25 % à 100 % en poids de fibre filée ou de filament de polyoléfine ou polyester.

11. Constituant de coeur selon la revendication 10, dans lequel le constituant de remplissage de la zone de vulnérabilité comprend environ 50 % à 100 % en poids de fibre filée ou de filament de polyoléfine ou polyester.

12. Constituant de coeur selon l'une quelconque des revendications 1 à 10, caractérisé en outre en ce que la zone de vulnérabilité comprend environ 25 % à 100 % de fibre filée ou de filament de polyoléfine ou polyester et environ 75 % à 0 % en poids de fibres à base de cellulose.

13. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre en ce que la zone de vulnérabilité comprend d'environ 0 % jusqu'à environ 50 % en poids d'une fibre à base de cellulose.

14. Constituant de coeur selon l'une quelconque des revendications 1 à 10, caractérisé en outre en ce que la zone de vulnérabilité comprend environ 25 % à environ 75 % de fibre filée ou de filament de polyoléfine ou polyester et environ 75 % à environ 25 % en poids de fibres à base de cellulose.

15. Constituant de coeur selon l'une quelconque des revendications précédentes, dans lequel la zone de coeur supplémentaire comprend des fibres à base de cellulose.

16. Constituant de coeur selon l'une quelconque des revendications précédentes, dans lequel la zone de coeur supplémentaire contient d'environ 25 % à 100 % en poids d'une fibre à base de cellulose.

17. Constituant de coeur selon la revendication 15, dans lequel la zone de coeur supplémentaire contient d'environ 50 % à 100 % en poids d'une fibre à base de cellulose.

18. Zone de coeur selon les revendications 3 ou 4, dans laquelle la zone de vulnérabilité comprend environ 25 % à 100 % de fibre ou filament de polypropylène ou polyéthylène et 0 % à environ 75 % en poids de fibre à base de cellulose, et dans laquelle chaque zone de coeur supplémentaire comprend environ 25 % à 100 % de fibre de cellulose et 0 % à environ 75 % en poids de fibre ou filament synthétique, et dans laquelle chaque zone de coeur supplémentaire a une quantité de fibre à base de cellulose plus grande que les zones de coeur supplémentaires géométriquement plus proches de la zone de vulnérabilité.

19. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre en ce que les constituants de remplissage dans la zone de vulnérabilité comprennent une fibre ou un filament ayant une valeur dpf moyenne dans la gamme d'environ 3 à environ 50 dpf, et les constituants de remplissage dans la zone de coeur supplémentaire comprennent une fibre ou un filament ayant des valeurs dpf moyennes dans la gamme d'environ 1 à environ 40 dpf.

20. Constituant de coeur selon la revendication 19, dans lequel les constituants de remplissage dans la zone de vulnérabilité comprennent une fibre ou un filament ayant une valeur dpf moyenne dans la gamme d'environ 10 à environ 40 dpf, et les constituants de remplissage dans la zone de coeur supplémentaire comprennent une fibre ou un filament ayant des valeurs dpf moyennes dans la gamme d'environ 2 à environ 40.

21. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre

en ce que la zone de vulnérabilité ou la zone de coeur supplémentaire contient un superabsorbant.

22. Constituant de coeur selon la revendication 21, dans lequel le constituant de coeur supplémentaire a jusqu'à 10 % en poids de superabsorbant.

23. Constituant de coeur selon l'une quelconque des revendications précédentes, dans lequel les zones de coeur supplémentaires contiennent d'environ 20 % à environ 50 % en poids de superabsorbant.

24. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre en ce que la zone de coeur supplémentaire est liée à au moins une zone de coeur adjacente supplémentaire ou à la zone de vulnérabilité.

25. Constituant de coeur selon l'une quelconque des revendications 1 à 6, caractérisé en ce que ladite au moins une zone de coeur supplémentaire est en contact latéral avec ladite zone de vulnérabilité.

26. Constituant de coeur selon les revendications 1 à 6, caractérisé en outre en ce que ladite au moins une zone de coeur supplémentaire est placée de façon à permettre une migration de fluide radiale depuis la zone de vulnérabilité jusqu'à ladite au moins une zone de coeur supplémentaire.

27. Constituant de coeur selon l'une quelconque des revendications précédentes, caractérisé en outre en ce que la fibre ou le filament formant les constituants de remplissage dans la zone de vulnérabilité et les zones de coeur supplémentaires est d'une longueur constante.

28. Constituant de coeur selon l'une quelconque des revendications 1 à 27, caractérisé en outre en ce que la valeur moyenne du rapport volume de fibres ou de pellicule fibrillée sur surface des fibres ou de la pellicule fibrillée dans la zone de vulnérabilité est dans la gamme d'environ 1 cm^3/20 000 cm^2 à environ 1 cm^3/500 cm^2, et la valeur moyenne du rapport volume des fibres ou de pellicule fibrillée sur surface des fibres ou de pellicule fibrillée dans la zone de coeur supplémentaire est dans la gamme d'environ 1 cm^3/25 000 cm^2 à environ 1 cm^3/40 000 cm^2.

29. Constituant de coeur pour utilisation dans un article absorbant un fluide tel que revendiqué dans l'une quelconque des revendications précédentes, caractérisé en outre en ce que la zone de vulnérabilité comprend environ 50 % en poids de fibre synthétique et environ 50 % en poids de fibre à base de cellulose, et en ce qu'une première zone de coeur supplémentaire est disposée en configuration radiale autour de la zone de vulnérabilité, et une seconde zone de coeur supplémentaire comprenant environ 100% d'une fibre à base de cellulose est disposée de façon adjacente à, et en configuration radiale autour de la première zone de vulnérabilité.

30. Procédé de préparation d'un constituant de coeur pour utilisation dans un article absorbant un fluide, comprenant le fait de disposer au moins une zone de coeur supplémentaire et d'une zone de vulnérabilité, caractérisé en ce que les zones sont constituées d'une fibre ou d'un filament possédant différentes tailles moyennes de pores et valeurs moyennes de fraction volume des fibres ou filaments sur surface des fibres ou filaments ; la zone de vulnérabilité est placée dans le constituant de coeur pour une exposition maximale à une humidification initiale et ladite au moins une zone de coeur supplémentaire est disposée en relation directe ou indirecte de réception d'un fluide à la zone de vulnérabilité et dans des régions d'exposition réduite à une humidification initiale, et caractérisé en outre en ce que ladite au moins une zone de coeur supplémentaire a une taille moyenne des pores et une valeur moyenne de fraction volume des fibres ou filaments sur surface des fibres ou filaments plus petites que les respectives taille moyenne des pores et valeur de fraction moyenne volume des fibres ou filaments sur surface des fibres ou filaments dans la zone de vulnérabilité ; et en ce que lorsque deux zones de coeur supplémentaires ou plus sont utilisées, le degré de différence de taille moyenne des pores et de valeur moyenne de fraction volume des fibres ou filaments sur surface des fibres ou filaments entre les zones de coeur supplémentaires augmente en fonction de l'augmentation de distance depuis la zone de vulnérabilité et de la réduction de risque d'humidification initiale.

31. Procédé selon la revendication 30, caractérisé en ce que la zone de vulnérabilité a un angle moyen de contact liquide-solide supérieur à celui de ladite au moins une zone de coeur supplémentaire et en ce que lorsque deux zones de coeur supplémentaires ou plus sont utilisées, le degré de différence de contact liquide-solide moyen augmente en fonction de l'augmentation de distance depuis la zone de vulnérabilité et de la réduction de risque d'humidification initiale.

32. Procédé pour la préparation d'un constituant de coeur pour l'utilisation dans un article absorbant un fluide tel que revendiqué dans les revendications 30 ou 31, caractérisé en outre par l'étape consistant à disposer les zones de coeur supplémentaires autour de la zone de vulnérabilité en une disposition semi-concentrique, ou en configuration latérale autour de la zone de vulnérabilité, ou en configuration axiale en dessous de la zone de vulnérabilité,

ou en configuration radiale autour de la zone de vulnérabilité.

33. Article absorbant un fluide comprenant, en combinaison, le constituant de coeur retenant un fluide de l'une quelconque des revendications 1 à 29 disposé dans au moins une matière de couverture perméable à un fluide et une couche support imperméable à un fluide.

Fig.1.

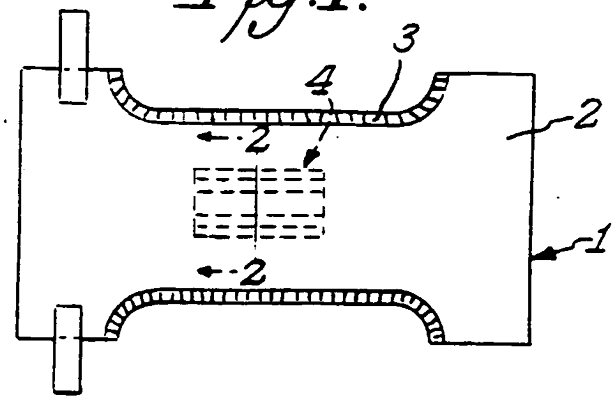

Fig.2.

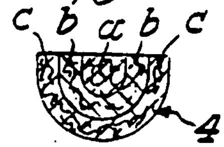

Fig.3.

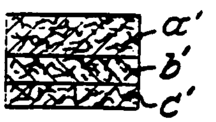

Fig.4.

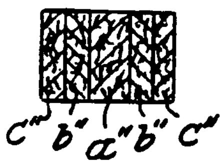

Fig.5A.

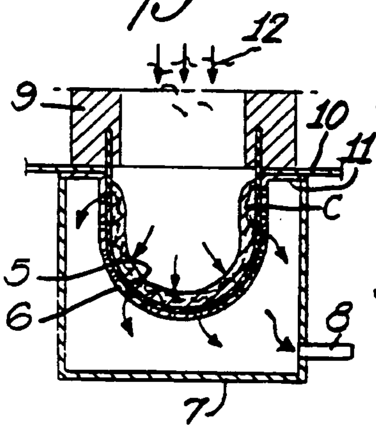

Fig.5B.

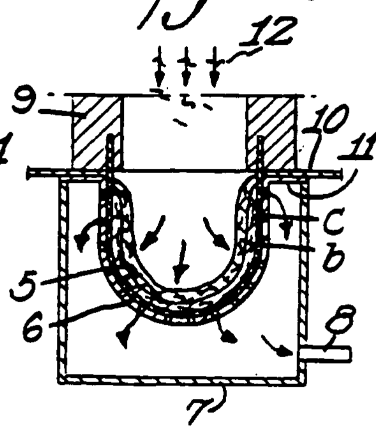

Fig.5C.

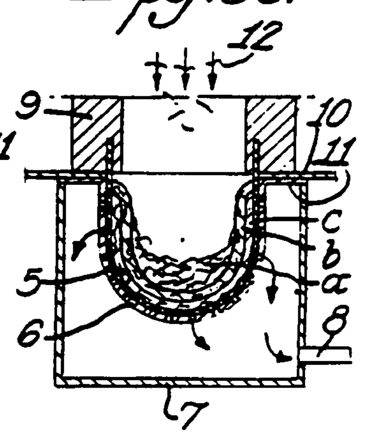

FIGURE 6

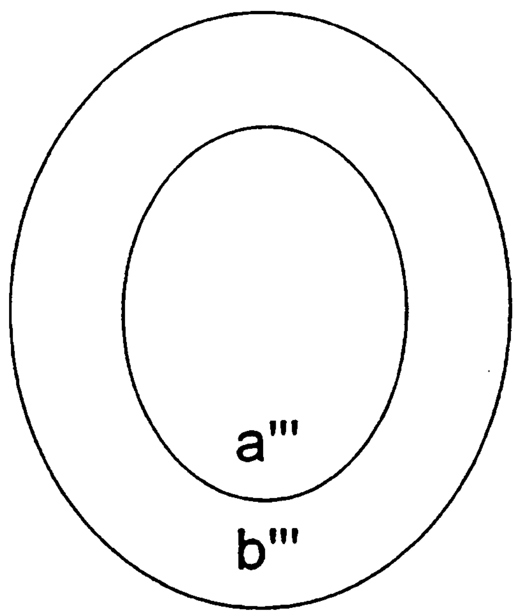

FIGURE 7